REMARKS

Applicants submit herewith an Information Disclosure Statement (IDS) along with this Amendment. No fee is due for the filing of this IDS as it is being submitted within 3 months of the date of the Office Action in a corresponding application wherein the art was first cited.

Applicants have amended the specification to correct minor typographical and/or translational errors. No new matter has been added. Entry of these amendments is respectfully requested.

Claims 1-7 are currently pending in the application. Claims 1-2 and 5-7 are withdrawn from prosecution as being directed to non-elected inventions.

Claims 3-4 have been amended and new claims 8 and 9 have been added. Support for these amendments can be found in the specification, for example, on pages 19-22.

Claims 3-4 stand rejected under 35 U.S.C. §103(a) as being unpatentable for obviousness over U.S. Patent No. 5,039,576 to Wilson. With respect to claim 3, the Examiner states that Wilson teaches a production method of a film carrier tape for mounting electronic devices thereon which comprises plating at least a part of a wiring pattern formed on an insulating film with a tin-bismuth alloy (column 2, lines 11-16; column 9, lines 33-34); and washing a portion plated with the tin-bismuth alloy "as quickly as possible" (see column 10, lines 6-16).

The Examiner goes on to state that Wilson does not expressly teach that the portion is washed within 6 seconds after the plating is completed, as claimed in claim 3, but does teach washing the portion "as quickly as possible, to avoid staining" at column 10, lines 6-16. The Examiner states that it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation", citing *In re Aller*, 105 USPQ 233, 255 (CCPA 1955).

The Examiner concludes, therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to plate at least a part of a wiring pattern formed on an insulating film with a tin-bismuth alloy, and then wash the

portion as quickly as possible, to avoid staining, as expressly taught by Wilson, wherein the washing takes place within 6 seconds after the plating is completed.

Wilson teaches at column 10, lines 14-16 that "The plated conductive substrate is thereafter washed thoroughly as quickly as possible, to minimize staining". However, the present invention is made on the basis of the discovery of a new problem, which Wilson has not recognized, namely, a substitution between tin on the surface of the tin-bismuth alloy deposit with bismuth in the plating solution occurs when the plating solution remains on the alloy deposit for more than 6 seconds. This substitution will lead to non-uniformity of the bismuth content along the thickness direction of the tin-bismuth alloy deposit, and fluctuation of the melting point as a result. The fluctuation of the melting point of the alloy deposit will have an influence on the bonding property of the device, and so on.

Wilson does not at all recognize or suggest any solution to the problem of creating a substitution between tin on the surface of the tin-bismuth alloy deposit with bismuth in the plating solution when the plating solution remains on the alloy deposit for more than 6 seconds. In other words, Wilson clearly does not recognize a problem of an inhomogeneous tin-bismuth alloy deposit resulting from contact with a plating solution for more than 6 seconds. Applicants have discovered a critical time within which the plating solution must be removed from the alloy deposit so as to avoid the tin-bismuth substitution problem. Wilson merely is concerned with a staining problem, which we would imagine requires much more time than 6 seconds to occur.

In a conventional plating apparatus for production of film carrier tape, a certain distance is inevitably needed between an electroplating tank (42 in Figs. 4 and 5) and a water-washing tank (60 in Figs. 4 and 5) positioned downstream of the traveling direction of the film carrier tape for structural reasons. One of the purposes may be to provide the washing tank 60 to prevent the staining of the plated area, as Wilson has stated. It generally requires about 10 seconds for the film carrier tape to enter the washing tank 60 after exiting from the electroplating tank 42.

Under the above circumstances, in the present invention the ejection washing nozzle 61 is provided between the electroplating tank 42 and the washing

tank 60 to enable the tin-bismuth alloy deposit on the wiring pattern to be ejection washed within 6 seconds, thus solving the problem of non-uniform bismuth distribution of the tin-bismuth alloy deposit along the thickness direction.

Nowhere in the Wilson patent does Wilson recognize the problem of a non-uniform tin-bismuth alloy deposit resulting from contact with a plating solution for more than 6 seconds. The six-second time period has been discovered by the Applicants as the critical time within which the plating solution must be removed from the alloy deposit so as to avoid the tin-bismuth substitution problem, which produces new and unexpected results over the prior art, including Wilson.

Wilson merely is concerned with a staining problem, which typically requires much more than 6 seconds to occur. Furthermore, Wilson does not teach or suggest providing a washing nozzle at a position between the plating tank and the washing tank where the film carrier tape can be washed immediately after the film carrier tape exits the plating tank.

Regarding claim 4, the Examiner states that Wilson teaches the method of claim 3 and further teaches that the plating is conducted by contacting at least a part of the film carrier tape or substrate with a plating solution for forming a tin-bismuth alloy deposit, citing column 6, line 62 bridging to column 10, line 5 of Wilson.

Clearly, Wilson teaches that the tin-bismuth plated substrate should be washed "as quickly as possible to minimize staining" at column 10, lines 14-16. The step of washing as quickly as possible after plating appears to be practiced in the prior art as discussed in the Background of the Invention portion of the present specification in a conventional plating apparatus discussed, for example, on page 3, lines 11-18 of the present application. It would appear reasonable that washing a plated substrate in such an apparatus wherein the washing occurs about 10 seconds after plating would meet the teachings of Wilson, i.e., "as quickly as possible to minimize staining."

Wilson does not at all recognize the problem solved by the present invention or suggest any solution to the problem of creating a substitution between tin on the surface of the tin-bismuth alloy deposit with bismuth in the plating solution

when the plating solution remains on the alloy deposit for more than 6 seconds. In other words, Wilson clearly does not recognize a problem of an inhomogeneous tin-bismuth alloy deposit resulting from contact with a plating solution for more than 6 seconds. Clearly, Applicants have discovered a critical time within which the plating solution must be removed from the alloy deposit so as to avoid the tin-bismuth substitution problem. Wilson merely is concerned with a staining problem, which we would imagine requires much more time than 6 seconds to occur. Hence, the present invention produces a new and unexpected result, i.e., a homogeneous tin-bismuth alloy deposit, which is not found in the prior art. As stated in *In re Aller*, cited by the Examiner, at 105 USPQ 233, 235 (CCPA 1955):

> Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art. [Emphasis supplied]

The claimed time limit of 6 seconds is critical to achieve this new and unexpected result nowhere disclosed or suggested in the prior art. Hence, the time limit of 6 seconds imparts patentability to the claimed process.

Claim 4 has been amended herein to specify that the film carrier tape is conveyed in a vertically oriented, stood-up position. Wilson does not teach or suggest such a process at column 9, line 62 to column 10, line 5, contrary to the Examiner's statement on page 3 of the Office Action.

New claims 8 and 9 set forth a technical feature that the water is ejected from the washing nozzle 61 along the traveling direction of the film carrier tape 10, and that receivers 62 are provided to prevent the splash of water and to enhance the removal of the plating solution remaining on the film carrier tape 10.

As shown in Figs. 4 and 5, the film carrier tape 10 travels in the plating tank 42 in the stood-up configuration with one edge down, and exits the plating tank 42 through a slit outlet opening 51 in this configuration. From the slit outlet opening 51 of the plating tank 42, a small amount of the plating solution will leak out. Therefore, a collection device which receives the leaked plating solution is disposed

below the slit outlet opening 51. The collected plating solution is recycled to the plating tank 42.

When the water is ejected from the washing nozzle to the film carrier tape, the water will be scattered around by collision with the film carrier tape 10. The scattered water may dilute the plating solution collected in the collecting device. The structure of claim 8 will prevent the splash of water and dilution of the plating solution collected in the collection device.

In addition, Applicant submits the enclosed Supplemental Information Disclosure Statement providing references cited in a corresponding Korean application.

In conclusion, based on the foregoing amendments and remarks, Applicants believe the present invention is in condition for allowance. The Examiner's reconsideration and allowance of claims 3-4 and 8-9 are respectfully requested.

Respectfully submitted,
THE WEBB LAW FIRM

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